THE EXTENSION OF THE FIELD OF TREATMENT OF CERTAIN RENAL AND VESICAL CONDITIONS THAT IS MADE AVAILABLE BY A NEW CONTRIVANCE FOR LONG CONTINUED OR PERMANENT DRAINAGE OF THE KIDNEYS THROUGH RENAL FISTULA IN THE LOIN.*

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If life could be made not only tolerable but comfortable for persons with long standing or permanent renal fistula, in what respects would this fact modify or enlarge the field of treatment of cases of renal and vesical disease?

In the writer's belief the following advantages would be derived: 1. Primarily we should be enabled to save a good many kidneys which we are now accustomed to sacrifice in order to spare the patients the distress arising from the presence of a renal fistula. Thereby we should at the same time, of course, avoid the dangers, whatever they may be, attending the performance of nephrectomy and such subsequent ones as are involved in the fact of having but one kidney.

Further than this we should be enabled to carry out certain new plans of treatment which have hitherto not been available because of the fear of creating a permanent and distressing fistula. With this end in view, the writer proposes the simultaneous performance of bilateral nephrostomy, tying off of both ureters at the same time and establishing permanent renal fistulæ, thus wholly diverting the entrance of all urine into the bladder, for the following purposes:

1. *As a palliative measure.*—(*a*) In cases of inoperable vesical tumor. (*b*) In cases of vesical tuberculosis originat-

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ing in descending infection, in which both kidneys are involved in the tuberculous process and when the tuberculous lesions of the bladder are causing suffering. In the latter condition also there might be expected to be better results obtained from the local treatment of the vesical tuberculous lesions.

2. *As a step preliminary to the total extirpation of the bladder in certain cases of vesical tumor.*—This proposal was made by the writer at the Montreal meeting of this Association in 1905 and published in the December number of the ANNALS OF SURGERY of the same year. It is referred to again now merely to reaffirm the writer's position with regard to it, which has been strengthened with respect to one of its features by the practical experience of three cases in which he has simultaneously performed bilateral nephrostomy and which have supported his contention that shock was not an element to be dreaded from the performance of the operation upon the two kidneys at the same time. The proposal was as follows:

That instead of doing ureteral implantation in connection with partial resections or total extirpations of the bladder in cases of tumor of that organ, the procedure be wholly abandoned, and that simultaneously performed bilateral lumbar nephrostomy be substituted for it, and that it be done as a step preliminary to the removal of the bladder, the latter intervention being carried out afterwards at periods which will vary according to the conditions existing in each case. That this course be pursued in cases of carcinoma of the bladder in which *any* radical operation is proper to do, and to recurrent tumors following the removal of benign neoplasms, if there is any reason to believe the recurrent growth to be of malignant nature.

The success of these measures must depend in large degree upon the possibility of arranging the drainage from the kidneys after the lumbar nephrostomies in such manner as to be comfortable, and thus to be secure of avoiding the creation of a condition as intolerable in its way as that for the relief of which it was undertaken.

This object the writer believes he has attained by a very simple contrivance which he has devised, whereby that feature of renal fistula which is the one which causes it to be such an infirmity, is entirely overcome. The greatest trials of renal fistula are the constant soaking of the clothing and dressings with urine, and the unpleasant odor which emanates from them. The contrivance designed by the writer keeps the patient perfectly dry, and can be worn without attracting attention and with entire comfort. It is composed as follows:

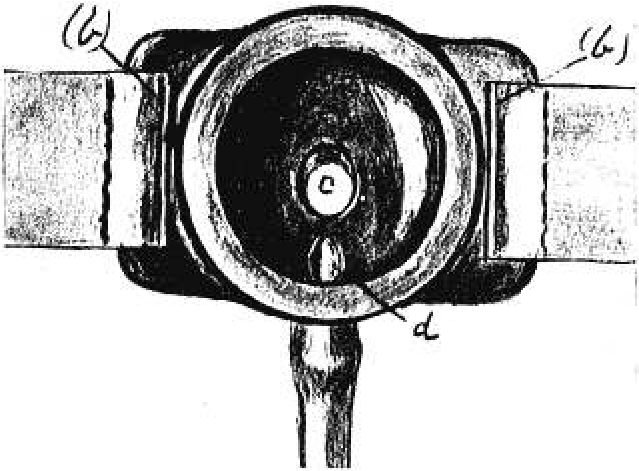
1. A hard rubber cup-shaped shield through which the tube that enters and drains the kidney is passed (fig. 1).
2. A light metal receptacle into which the urine is conveyed (fig. 2).
3. A rubber tube attached to the bottom of the receptacle by means of which the latter is emptied (fig. 2*a*).
4. Two elastic bands or belts one inch in width which pass around the body and by which the shield and the receptacle for the urine are held in place (fig. 3, *a* and *b*).

1. *The Shield.*—The shield is made up of a circular, cup-shaped, central part, and two side wings. The former is perforated by two holes (fig. 1, *c* and *d*), one of them passing through its centre and having a downward slant in its course through the shield in order to avoid being obliged to give the kidney drainage tube a sharp bend and thus narrow it as it passes down to the receptacle. The second hole is just within the inner margin of the rim of the circular part of the shield and at the lowest point in the circumference when the shield is in place upon the surface of the back. The purpose of this hole is to drain the cup of the shield, which it does by the smaller of the two tubes which pass to the receptacle (fig. 4, *a*).

The cup of the shield catches whatever urine leaks around the outer sides of the kidney drainage tube, and this leakage is at once passed into the can in the manner already mentioned.

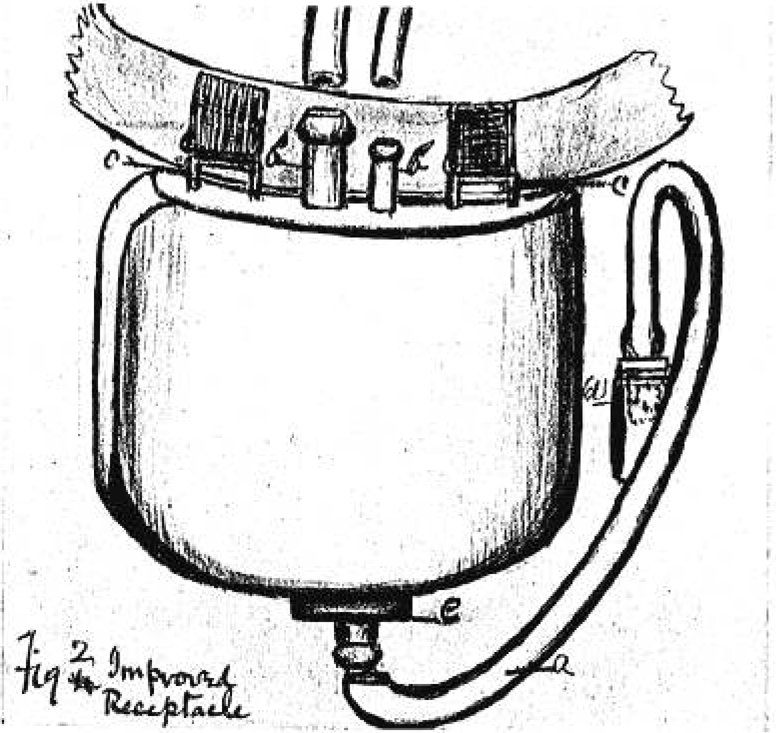
Elastic bands one inch in width are passed through the openings in the wings of the shield and are thus attached to it (fig. 1, *b* and *b*), and being passed around the body and buckled in front, form the belt by which the shield is constantly held close upon the surface of the loin.

Fig. 1.



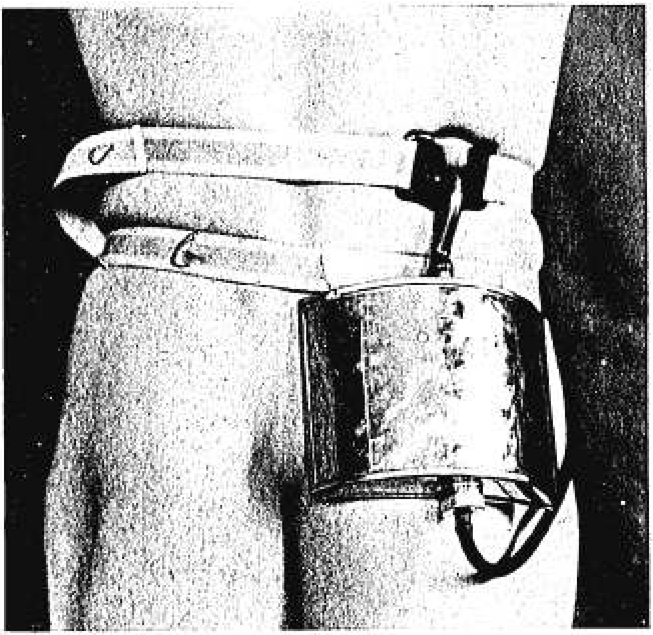
The shield with the elastic bands attached and the tube which drains the shield.

FIG. 2.



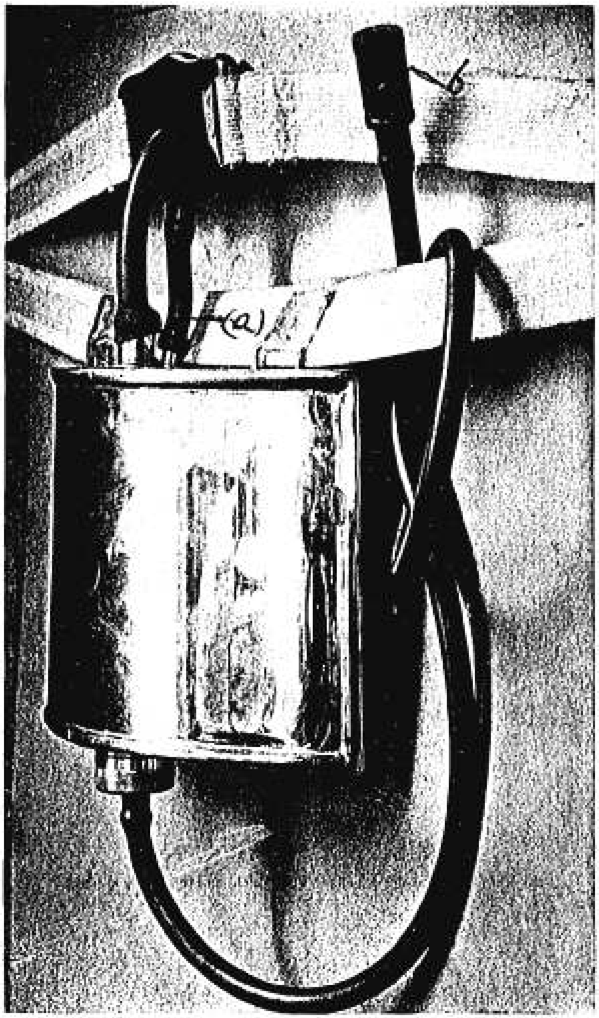
Improved receptacle.

FIG. 3.



(*a*) and (*b*) are the elastic belts to keep shield and receptacle in place.

FIG. 4.



The shield-receptacle with their tubes and belts attached to them, and strapped to a board to show the individual parts of the apparatus. (*a*) tube which drains the cup of the shield.

The tube draining the kidney directly, and which passes through the hole in the centre of the shield, must be one or two sizes larger than the hole, in order that it shall bind firmly against the sides of it, and thus be prevented from changing its position to or fro, and pressing injuriously on the kidney on the one hand, or being withdrawn too far to efficiently drain it on the other.

The tube draining the cup is to be fitted over the end of the smaller of the two metal tubes which are placed in the middle of the upper surface of the receptacle, and in this way the junction between the cup of the shield and the receptacle is effected. The main drainage tube from the kidney is passed in the same way over the end of the larger metal tube of the receptacle, or if the drainage tube is too small to allow this to be done, it can be passed *into* the metal tube instead.

The calibre of the central hole in the shield is about 28 of the Charrière scale. If the kidney drainage tube is in any case so small that it will not bind in the hole, its calibre at that point can be sufficiently increased by passing over it a second bit of tubing just where it traverses the hole.

It is important to adjust the kidney drainage tube at the spot within the kidney at which its end drains the organ most effectively and at the same time causes the patient no discomfort. Once this has been determined, a mark should be made upon the catheter or drain just where it emerges from the outer side of the shield, in order that time shall not be wasted in re-adjusting the tube each time that it is introduced.

The tubes and all parts of the apparatus except the shield and the belts should be boiled in water once each day.

2. *The receptacle* (fig. 2).—The receptacle is a can made of German silver, curved to fit the upper part of the gluteal region and provided with the following things. Upon the middle of its upper end are two short metal tubes (fig. 2, *b* and *b*), upon the larger of which the main kidney drainage tube is attached. The smaller one receives the end of the tube which drains the cup of the shield. Two pieces of bent wire (fig. 2, *c* and *c*) set into the inner edge of the receptacle to

which the elastic belt is attached which keeps the can in place. A metal cap (fig. 2, *c*) in the middle of the bottom of the can which unscrews and allows it to be more readily cleaned.

3. *The tube for draining the receptacle* (fig. 2, *a*).—A tube, a foot and a half to two feet long, is attached to the screw cap in the bottom of the can and is led round to the front of the body, where it is tucked under the belt and its end brought over it and allowed to hang downward. The further end of this tube is provided with a hard rubber cap (fig. 4, *b*), one end of which has the form of a stem which slips into the rubber tube. In this stem is a hole (fig. 2, *d*). The hole is closed by the hard rubber cap when it is screwed home against the shoulder which is just behind the hole, while when the cap is screwed outward in the other direction, the hole is uncovered and allows the contents of the can to escape through it. The capacity of the can is about ten ounces, and consequently it does not require to be emptied more than two or three times daily. When it is desired to do this, the tube which drains the can is taken from beneath the belt in front and the hole just described at its end being opened, the can is evacuated of its contents. The hole is then closed and the tube replaced. By this contrivance the patient is spared the trouble of detaching any parts of the apparatus from each other during the entire day.

THE MANNER OF ARRANGING THE DRAINAGE AT NIGHT.

At night the can is detached and long tubes are substituted for the ones which drain the shield and the kidney. The two tubes are led to a bottle which is fastened to the side of the bed and the drainage is received by that during the night.

A semi-reclining position ensures better drainage than if the patient lies quite flat. The receptacle can be attached nearer or further away from the shield or can be carried slightly to one or the other side of it—corresponding changes being made in the length of the tubes—as the patient may find to be most convenient and comfortable. Fig 3 shows the apparatus in position with the tube which drains the can passed around the body to be placed under the belt in front. The essentials of the receptacle are that it shall be light, fitted to the surface upon which it lies, its capacity sufficient to avoid the necessity of emptying it too often and of such a character that it can be readily cleaned. The shield is given a very slight curve in order that it may adapt itself more completely to the surface of the body, and thus insure the cup fitting tight and not leaking.

The object aimed at in this contrivance is to keep the patient dry, the failure to do this hitherto has been the one distressing feature of renal fistula. It is owing to this feature that individuals with renal fistula have been wholly disabled and practically isolated from their fellows because of the unpleasant odor arising from that source.

A receptacle is of course essential to the contrivance, but it may be varied almost indefinitely with respect to size, shape, and the place in which it is worn on the body and also as to the material of which it is made. The writer has one patient who wears for the receptacle, the usual form of rubber portable urinal bag attached to the thigh, and another who wears the metal can on the back. The advantage of the metal can is that it can be boiled as often and as long as one likes, has no odor; moreover it is easier to arrange the receiving and emptying tubes on a metal than on a rubber reservoir. The prime essential of the contrivance is the shield. It is that which keeps the patient dry and which keeps the tube in its proper place in the kidney where it will most efficiently drain the organ, and the essential features of the shield are its cup-shaped centre and the hole and tube which drain this cup. It is well to note the following things with regard to the shield:

In some cases there will be a furrow made by the cicatrizing of the wound through which the fistula passes and along the line of this furrow, the shield may fail to be held firmly against the surface and urine would then escape from the cup. The same may be true if the incision is made parallel with the lower border of the last rib, for the shield may then rest on one of its edges upon the surface over the rib and the other on the softer tissues. This fact together with the respiratory movements of the rib's might very likely displace it enough to allow the urine to escape from the cup elsewhere than through the hole designed to drain it. Again some patients may find the pressure of the hard rubber rim of the cup uncomfortable. To obviate these difficulties, the rim of the cup may be made a little wider and a channel with overhanging edges cut in it, into which a ring or tube of soft rubber can be snapped and held by the undercut edges of the channel. The soft rubber will adapt itself to the irregularities. of the surface, and may be advantageous in some instances. In case of the existence of a deep furrow in the line of the cicatrix which must be filled up to prevent the fluid from escaping from the cup, the rubber ring can be enlarged somewhat at that point in order to adapt itself to the surface. As a matter of fact, the skin of the immediately adjacent soft parts will usually bulge into such a depression when the shield is pressed hard against the surface and will fill it sufficiently to prevent leakage.

The writer has had this device in use with entire success in two instances. In one of them a little change in the adjustment and the size of the cup of the shield was required before it worked properly. The contrivance can be equally well applied, of course, to fistulous openings of transplanted ureters and other similar conditions connected with the different organs of the body, with which fistula is connected. This apparatus is made by Rodman and Shurtleff, 120 Boylston Street, Boston.

One word with regard to the advantages of nephrostomy as compared to ureteral implantation. The latter is open to the serious objection that it frequently invites renal infection because of contraction of the implanted orifice of the ureter or of the ureter itself at some point between the orifice and the renal pelvis, and, in case of intestinal implantation, because of its being a septic locality. The following tables show what the results of ureteral implantation were found to be in 94 cases. The operative mortality for the whole series was 41.4 per cent.; 23.4 per cent, was directly due to ureteral implantation. The conditions in which the implantations were done are as follows:

I

Vesical Tumors.	Cases.	Operative. Deaths.	Causes of Death.	Later Deaths.
Suprapubic not resections	11	0	....	2. One to ureteral contraction .... 1 Not stated.
Partial resect..........	23	11	Ren. infect..... 3 Shock .... 4 Infilt. of urine .. 2 Peritonitis...... 2	
Total extirp...........	38	19	Ren. infect .....10 Shock .... 9 Pneumonia 1	3. Ren. inf.......... 2 Recurrence 1
Ureter cut in abdom. operations	22	9	Ren. infect..... 6	
	94	39		

Cases, 94; operative deaths, 39 or 41.4 per cent. Due to ureteral implantation, 22 or 23.4 per cent. mortality.

These cases in detail are as follows:

II

TOTAL EXTIRPATION OF THE BLADDER—38 CASES.

Treatment of Ureters.	Operative. Recovered.	Operative. Deaths.	Causes of Death.	Due to Ureteral Implantation.	Later Deaths and Causes of.
Abandoned in wound ...	2	2	Renal infect .... 1 Shock 1	1	
Sutured into intestine ...	5	10	Renal infect .... 5 Shock .... 4 No data 1	5	1 at 3½ months, renal infect. 1 at 14 months, no data.
Sutured to skin	3	1	Renal infect 1	1	1 at 13 months, renal infect. 1 at 6 months. Recurrence.
Sutured into vagina.....	3	2	Renal infect .... 1 Shock 1	1	
Sutured to urethra......	1	4	Renal infect .... 2 Shock 2	2	
	14	19	19	10	4

Without data..	5
Total number	38
Deaths due to ureteral implantation........................ ...	10

OPERATORS REPORTING THE ABOVE CASES.

Bardenheuer	2
Pawlik	1
Albarran	1
Modlinski	3
Kuster	1
Wassilief	1
McCosh	2
Giordano	2
Chalot	1
Kossinski	1
Kummel	1
Viljaminow	1
Bergenhem	1
Mann	1
Verhoogen	1
Vaughan	1
Woolsey	1
Schede	1
Turetta	1
Hogge	1
Krause	1
Kayser	1
Lund	1
Mayo Robson	1
Gopel	1
Harris	1
Tuffier	1
Lindner	1
Zeller	1
Garre	2
Wendel	1

III

PARTIAL RESECTIONS—23 CASES.

Treatment of Ureters.	Operative. Recoveries.	Operative. Deaths.	Causes of Death.		Due to Ureteral Implantation.
Implanted into bladder	12	9	Shock	4	
			Renal infect.	2	2
			Infiltration of urine	2	2
			Peritonitis	1	
				9	4
Abandoned in the wound	0	2	Peritonitis	1	
	12	11	Cellulitis	1	1
				2	5

Total, 23; deaths, 11. 47.8 per cent.

Deaths due to ureteral implantation, 5. 45.4 per cent. of deaths due to ureteral implantation.

	Cases.
Israel	2
Czerny	5
Albarran	2
Bardenheuer	2
Schuchard	1
Helferich	1
Giordano	1
Schilling	1
Verhoogen	1
Rafin	1
Rehn	1
Kuster	1
Mickulicz	2
Berg	1
Vincini	1
Total	23

Implantation into bladder, 21; abandoned in wound, 2.

III.

VESICAL TUMOR.

OPERATIONS OTHER THAN PARTIAL RESECTION OR TOTAL EXTIRPATION.

Cases II. Deaths 0. Later 2.

Implantations into bladder 2. Later deaths 2. Due to ureteral implantation in one perhaps, not so in the other.

In 7 other cases there was an opportunity to test the patency of the ureter at various times subsequent to the operation. In one of these the ureter was apparently obliterated and the kidney was believed to have undergone atrophy. The patient was, however, in good health.

Operators in these cases were: Routier, Pernice, Krug (case observed 8 years after operation), Kalabin, Rafin, Wertheim, and Frantz (5 cases).

With direct drainage of the kidney through the loin, on the other hand, the objection which has been brought by the writer against ureteral implantation, does not hold good, provided the drainage is thorough and thoroughly maintained, if ordinarly good care be taken of it, and the fistula prevented from recontracting. There is moreover the further advantage that nephrostomy and free drainage of the kidney directly through the loin is by far the best treatment that can be applied to cases of infected kidneys with suppuration, and to many of hydronephrosis, for which ureteral implantation is ineffectual, and in some instances actually invites an increase sooner or later of the malady. Furthermore, in such conditions, ureteral implantation gives no opportunity to explore the interior of the kidney, remove calculi, or break down partitions separating abscess cavities and so on, which nephrostomy does afford. Finally the mortality attending incision and drainage of the kidney is, per se, very small. While the contrary as has been shown is true of ureteral implantation.

It will be remembered that in the series of cases given above in which that procedure was carried out, death was caused by it in 23.4 per cent.

It is difficult to get an exact idea of the mortality of nephrostomy as an operation and the same is true of ureteral implantation, because of the serious conditions under which or in connection with which the two procedures respectively are done. The nearest approach that can be made to determining the operative mortality of each is by a comparison of the results of Maydl's operation with those of nephrostomy when done in cases of non-infected kidneys. Of 42 cases of Maydl's procedure for ectopia, 9 ended fatally or 21.4 per cent. (3 of the deaths or 7.1 per cent. were directly due to ureteral implantation). In 143 cases of hydronephrosis there were but 5 deaths following nephrostomy or 3.4 per cent. In 77 nephrostomies reported by Albarran, done for various conditions, there were 3 deaths or 3.7 per cent. mortality.